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SUMMARY REPORT OF FISH INVESTIGATIONS IN WOOD BUFFALO NATIONAL PARK JUNE, 1972

by
J. S. Nelson
and
M. J. Paetz

October, 1972

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and

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Fish and Wildlife Division, Alberta Department of Lands and Forests

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Introduction

The sinkhole region in Wood Buffalo National Park, Alberta and Northwest Territories, has many interesting features to the ichthyologist as shown in two previous collecting trips of the authors (Nelson and Paetz, 1972). There are streams with high salt concentrations and sinkhole lakes with underground connections with other waters. There are two species of sticklebacks in which a high proportion of the individuals lack the pelvic skeleton in several localities. It is an area where three large species have their southermost distributional limits in Mackenzie drainage while several other small species are at their northern limits.

Materials and Methods

Whereas in past years our work was confined to areas accessible by road, this year we collected primarily in areas away from roads. A helicopter (Fig. 6) was used June 24 and 25. The methods of collecting are the same as described in Nelson and Paetz (1972).

Results

The sinkhole lakes and salt streams all lie in the northeastern portion of Wood Buffalo National Park. These lakes tend to be small, deep, and clear. On the other hand, many large lakes occur to the west which tend to be murky and shallow, with maximum depths of 4 to 10 feet (taken from depths plotted on maps in the forestry room of the Fort Smith government building).

A total of 11 species was collected from 7 sites in Wood Buffalo National Park (Table 1). Two sinkhole lake areas were examined, one in the Klewi drainage area and the other in the Pine-Lane Lake area. Some of the sinks consisted of deep depressions with or without water at the bottom (below ground level) while other sinkholes are filled with water to the top.

Several areas were examined which did not yield fish.

We observed many lakes in the park which are shown as dry marshes on the topography maps. The creeks were also generally higher than in previous years' observations.

In Klewi drainage two recent sinkhole systems were investigated. The first consists of a sinkhole in a side-bay of Klewi River with a collapsed tunnel opening (Fig. 1) which probably is connected to an elliptical sink several hundred yards away (Fig. 2). As indicated in Table 1, three species of fish were obtained immediately off the tunnel mouth. Unfortunately, it did not seem feasible to descend into the isolated sink to see if fish were in the visible waters. As seen in Fig. 2 there has been considerable collapsing and the side material is loose.

Further to the northwest, immediately south of a large shallow lake (with two basins and normally just a marsh), was another sinkhole system. This one consisted of an elongate sinkhole less than 100 feet from the Klewi system (Fig. 3). There appears to be an underground "tunnel" (there was a vertical "shaft" going down to it) under a ridge connecting the two. Again, the sides were too steep for us to sample the water for fish and it seemed unwise to enter it by helicopter. In

looking closely at the waters, however, we did not observe any fish. A brook stickleback (with the pelvic spines) was caught and released in the area of the Klewi off the rock face leading to the isolated sinkhole.

Fig. 4 shows the escarpment and several waterfalls on the Little Buffalo River. We have collected here previously and did not collect further this year.

A large area around Pine and Lane lakes consists of sinkholes, most of which probably contain fish. Fig. 5 is of one of many in an area southeast of Lane Lake. The sink was obviously deep (although appearing like a shallow bog in the black and white photo--all the sinks had a characteristic blue-green colour and could be clearly distinguished from shallow non-sink lakes). The sink had a good population of Iowa darters and northern pike (3 angled by M. J. Paetz--2 examined and found with empty stomachs). Brook sticklebacks were also present.

Lane Lake yielded 3 species of fish. It had a marl bottom and aquatic plants were present. It appears to consist of several "old" sinks (as does Pine Lake). Unlike Pine and Rainbow lakes, no minnows were found in Lane Lake.

We did not obtain any fish in Crane Lake after several seine hauls. The lake did not appear to have any sinkholes associated with it.

An unnamed sinkhole near 59° 24' N and 112° 06' W (southeast of Lane Lake) yielded 2 species of sticklebacks.

Further work on the many sinks between Lane and Pierre lakes would be desirable. The whole valley between Lane and Lynx lakes appears as though it could have been a continuous long lake in the past.

Mr. Ken Cooper has informed us that Indians report that northern

pike used to be in the Pierre to Lynx Lake chain (still present?). This species could perhaps have gained access to this area from the Hornaday River.

Fig. 6 shows a section of the Salt Plains (near 59° 56', 112° 25') with one of the salt springs shown in Fig. 7 (with salt deposits). In a side channel of the creek shown in Fig. 6 a water analysis showed the following values:

Total dissolved solids	7,886 ppm
Specific conductance	11,000 umho/cm
Total hardness	1,932 ppm ($CaCO_3$)
Total alkalinity	178 ppm ($CaCO_3$)
Calcium	564 ppm
Magnesium	125 ppm
Sodium	1,788 ppm
Sulfate	1,671 ppm
Chloride	888 ppm
Iron	0.2 ppm
Nitrate and nitrite	less than 0.1 ppm

It should be noted that most fresh water in Alberta and the Northwest Territories has less than 500 ppm total dissolved solids.

The Rainbow lakes consist of several old sinks with well-developed shorelines. Some slumping activity appeared to have taken place in relatively recent times as indicated by large numbers of mature tree trunks in the water. They are very scenic lakes and we had previously sampled two of them. Unfortunately this year, the water level was relatively high and a suitable helicopter land site along the unsampled lake margins could not be found.

The Nyarling River had previously attracted our attention and we had hoped that we might be able to sample this stream at some underground site. We flew the Nyarling for several miles below the highway, over its dry distinct basin. Water flow started up gradually and we did not observe any "tunnel" exit as we had anticipated. Several miles downstream the discharge was about 25 cubic feet per second and in a riffle area of large boulders burbot were very numerous.

Upstream, southwest of the highway, the river is also underground with several dry sinks apparent. The Nyarling exits Needle Lake and attempts to collect in the outlet area proved futile because of the extremely soft bottom. There is some volume of water for a few miles downstream, where it ceases at a beaver dam. No fish were observed in a short section of the stream.

Copp Lake appeared extremely shallow and we failed to find fish in it. Other nearby lakes also appeared to be extremely shallow and there were no sinkholes observed.

We also visited the Fort Smith water treatment plant (which was experiencing considerable difficulty with the high silt content of the Slave). Workers reported netting or seeing goldeye, lamprey, whitefish, and inconnu across the river immediately below the Fort Smith (Pelican) rapids.

Discussion

The material gathered here adds to our knowledge of unusual fish distribution patterns noted in Nelson and Paetz (1972). However, before enlarging our thoughts on the zoogeography of the Wood Buffalo National

Park area we hope to conduct more field work. However, it is of interest to note several points.

Iowa darters have their northermost locality record in Pine Lake. Only a few records exist for the Peace-Athabasca drainage to the south with continuous distribution starting only 330 miles to the south. We have now shown that they occur in at least two isolated sinkholes immediately south of Pine Lake (where fish cultural activities have taken place) and in all three they are very abundant.

Individuals of ninespine sticklebacks were known to lack their pelvic skeleton in Ireland and in two lakes and one stream in Canada--Pine Lake and Fox Holes lakes and Salt River. We can now add Lane Lake to this list. Interestingly, the ratio of normal to pelvic deficient individuals in Lane and nearby Pine Lake are considerably different. We have also found that all brook sticklebacks collected from Lane Lake and from a nearby unnamed sinkhole lack the pelvics. All brook sticklebacks previously collected from Pine Lake also lack the pelvis. We also have now surrounded the Pine and Rainbow lake area (where the majority or all of the brook sticklebacks lack the pelvis) with normal populations. All brook sticklebacks in an unnamed sinkhole south of Lane Lake and in Klewi drainage to the northwest, have complete pelvics. Further work in trying to understand why the Rainbow-Lane Lake area has a genetically different group of sticklebacks would obviously be of much zoological interest.

It seems very probable that some of the recent isolated sinkholes contain fish in areas where they could only gain access through the presumed underground tunnels. We also think it very probable that fish

occur in these underground systems. We think it very worthwhile to continue a search for them as well as learning more about the distributional patterns of fish and the pelvic skeletal loss in the sticklebacks. Having a collection of sticklebacks from the same lake over several years would provide useful information on the stability between generations of the pelvic skeletal deficiency.

The study has reenforced our view that Wood Buffalo National Park contains some "unique" fish populations and habitats that deserve recognition.

Acknowledgments

We are grateful to the Superintendent of Wood Buffalo National Park, Mr. Tom W. Smith, and to the Chief Park Warden, Mr. Ken Cooper, and to the Western Regional Director, the National and Historic Parks Branch, Department of Indian and Northern Affairs, for permission to work in Wood Buffalo National Park. Messrs. Smith and Cooper also provided valuable advice and information. Information from previous years from Dr. W. A. Fuller and Mr. E. Kuyt was also helpful.

The Pollution Control Division Laboratory of the Alberta Department of Environment kindly analysed our water sample.

We are very grateful for the financial support for this study provided by the National Research Council of Canada (grant A-5457), the Boreal Institute for Northern Studies, The University of Alberta, and the Provincial Fish and Wildlife Division. The $800 grant from the Boreal Institute was specifically provided for this research, for which we are especially grateful.

Literature Cited

Nelson, J. S. and M. J. Paetz. 1972. Fishes of the northeastern Wood Buffalo National Park region, Alberta and Northwest Territories. Canadian Field-Naturalist 86:133-144.

Territories, UAMZ = University of Alberta Museum of Zoology.

Locality	Latitude and longitude	Species	Specimens	UAMZ number	Pelvic skeleton state of sticklebacks
1. Nyarling River, WBNP, NWT	≈60°25′, 114°00′	*Lota lota*	8	3127	
		Couesius plumbeus	1	3128	
2. Klewi drainage, unnamed sinkhole. Mouth of "cave."	≈60°12′, 113°42′	*Chrosomus neogaeus*	5	3124	
		Semotilus margarita	7	3125	
		Culaea inconstans	26	3126	Complete in all 15 juveniles and adults, pectorals very short
3. Preble Creek, WBNP, NWT	60°02′, 113°12′	*Pimephales promelas*	1	3138	
		Semotilus margarita	10	3139	
		Couesius plumbeus	2	3140	
		Chrosomus neogaeus	34	3143	
		Chrosomus eos	48	3144	
		Catostomus commersoni	2	3141	
		Culaea inconstans	37	3142	All complete
4. Salt drainage, unnamed creek	≈59°56′, 112°25′	*Pungitius pungitius*	38	3136	5 without 3 with pelvic skeleton and 1 spine 30 complete
		Culaea inconstans	23	3137	1 with pelvic skeleton and 1 spine 22 complete
5. Lane Lake, WBNP, Alberta	59°28′, 112°10′	*Etheostoma exile*	83	3130	
		Pungitius pungitius	10	3129	8 without 2 with pelvic skeleton and 1 spine (deformed) 1 complete
		Culaea inconstans	60	3131	All without

Locality	Latitude and longitude	Species	Specimens	UAMZ number	Pelvic skeleton state of sticklebacks
6. Unnamed sinkhole, WBNP, Alberta	≈59°26′, 112°04′	*Esox lucius*	1	3133	
		Etheostoma exile	279	3134	
		Culaea inconstans	3	3132	All without, pectorals very short.
7. Unnamed sinkhole, WBNP, Alberta	≈59°24′, 112°06′	*Culaea inconstans*	42	3135	All complete.

Collections 1 and 2 were made June 24, 1972, by helicopter.

Collections 4-7 were made June 25, 1972, by helicopter.

Collection 3 was made June 26, 1972, by road.

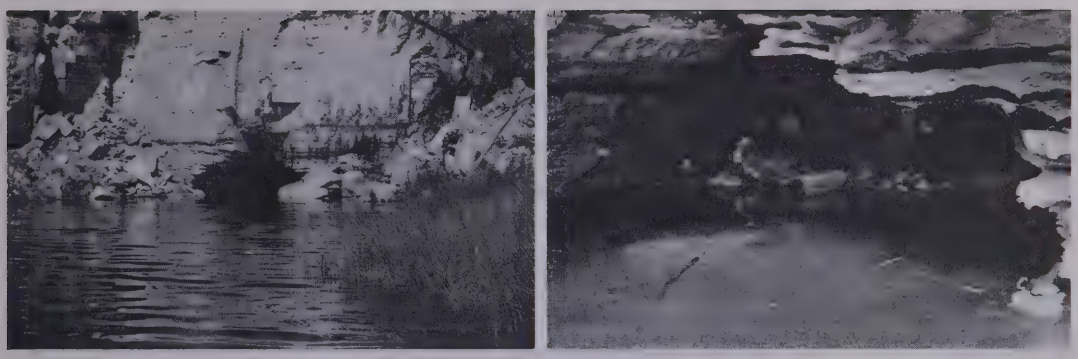

Fig. 1. Mouth area of underground "tunnel" (roof collapsed) in Klewi drainage near 60° 12' N. Lat. and 113° 42¼' W. Long. No current was observed. Three species of fish were obtained here in sinkhole off mouth of "tunnel."

Fig. 2. Recent "landlocked" sinkhole about 200 meters west of "tunnel" entrance in Fig. 1 (at 60° 12' N. Lat. and 113° 42½' W. Long.). The two are probably connected by an underground stream. Note the "entrance" and "exit tunnel" of this sinkhole.

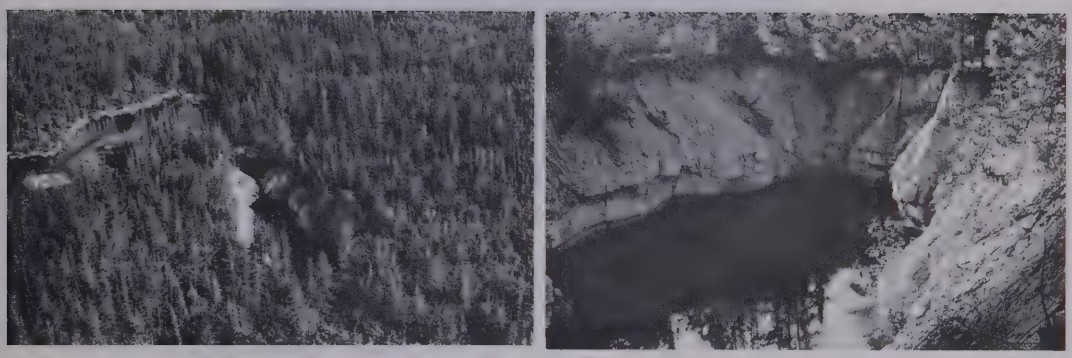

Fig. 3. Recent sinkhole (foreground) adjacent to Klewi drainage (background) near 60° 12½' N. Lat. and 113° 43' W. Long. Left - looking southeast toward Klewi system. Right - looking northwest; note the steep sides of the sinkhole.

Fig. 4. Falls on Little Buffalo River. Several species of fish have been obtained above these falls (see Nelson and Paetz, 1972).

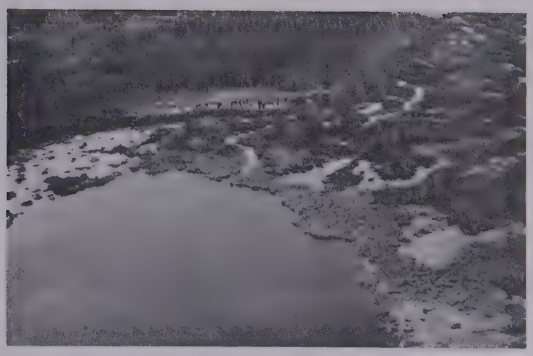

Fig. 5. Sinkhole near 59° 26' N. Lat. and 112° 04' W. Long., between Lane Lake and Hornaday drainage. Iowa darters were extremely numerous in the inlet. Although the surroundings suggest this to be a shallow bog it has steep sides and obviously drops for a considerable depth.

Fig. 6. Helicopter (Hughes 500) in Salt plains near 59° 56' N. Lat. and 112° 25' W. Long. A water sample taken here showed the total dissolved solids to be 7,886 ppm with the highest values in sodium, sulfate, chloride, and calcium.

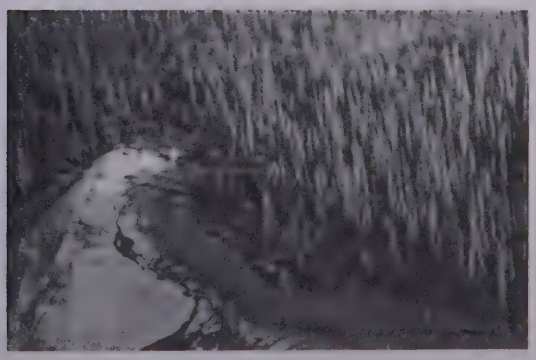

Fig. 7. One of the several salt-spring deposits to the southeast of Fig. 6.

APPENDIX I. Common and scientific names of the fish collected in Wood Buffalo National Park in 1972

Family Esocidae

Esox lucius - northern pike

Family Cyprinidae

Chrosomus eos - northern redbelly dace

Chrosomus neogaeus - finescale dace

Couesius plumbeus - lake chub

Pimephales promelas - fathead minnow

Semotilus margarita - pearl dace

Family Catostomidae

Catostomus commersoni - white sucker

Family Gadidae

Lota lota - burbot

Family Gasterosteidae

Culaea inconstans - brook stickleback

Pungitius pungitius - ninespine stickleback

Family Percidae

Etheostoma exile - Iowa darter

APPENDIX II. North to south sequence of named lakes in Pine-Pierre Lake valley sink. Numerous unnamed lakes occur between Lane and Pierre lakes.

1. Pine Lake
2. Lane Lake
3. Pierre Lake
4. Lynx Lake
5. Crane Lake

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